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Lowering Antibiotic Resistance Utilizing Breastmilk

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ABSTRACT

Antibiotic resistance is considered an emerging crisis in the healthcare world. This crisis has the potential to cause many bacterial diseases that cannot be cured using antibiotic drugs, which can lead to serious infections and death. There have been numerous studies that have found that sugars, proteins and protein-lipid complexes in breastmilk have antimicrobial properties. It has been proposed that these properties in breastmilk can help solve the antibacterial resistance crisis. This research project involved studying antibiotic resistance and how breastmilk can help solve this increasingly prevalent problem.

The implementation step of this research project involved a PowerPoint presentation detailing key facts about antibiotic resistance and breastmilk, while also proposing a plan to help solve this crisis. This was presented to a nursing class and the presentation was evaluated for effectiveness using an anonymous survey. There was a very positive response to the presentation with a few comments on ways to make the information presented better. After the research, implementation, and evaluation, many ideas were put forth that would be beneficial if a furthering of this research was desired.

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Introduction

Antibiotic resistance is considered an emerging crisis in the healthcare world. This is due to the practice of overprescribing of antibiotic drugs by healthcare professionals, not using antibiotics correctly or just the nature of the drug and mutations (Chordas, 2018, p. 53). There have been numerous studies that have found that sugars, proteins and protein-lipid complexes in breastmilk all have antimicrobial properties. It has been proposed that these properties in breastmilk can help solve the antibacterial resistance crisis (Mroz, 2017). One focus that needs to be implemented is educating women and key male counterparts on the benefits of breastfeeding, especially the antibacterial benefits of breastmilk (Willumsen, 2013).

The main purpose of this project was to provide education. After realizing the lack of education regarding antibiotic resistance, three main topics were chosen to address. These included: what antibiotic resistance is, ways in which it develops, and ways in which individuals can prevent it. The targeted population included women of all walks of life, but primarily preconception women. This target population branched out to include key male counterparts on antibiotic resistance and how breastmilk can help lower antibiotic resistance.

Significance of the Problem to Nursing Practice

Antibiotic resistance is a significant problem to healthcare as a whole, and a major threat that involves nursing practice. There are many reasons this issue is surmounting to such a great threat. Some of the reasons are the overprescription of antibiotics, patients

not using the antibiotics correctly, antibiotics prescribed for non-bacterial illnesses, and just a general mutation in the bacterial genes (Chordas, 2018, p. 53). If this big crisis is not slowed down or stopped, there may be no way for us to stop bacterial infections through antibiotics.

Many bacterial infections that we see in nursing are easily curable by a round of antibiotics. Think of strep throat, eye infections, and unclean wounds. These are typically taken care of quite easily with antibiotics (Chordas, 2018, p. 53). With antibiotic resistance, these seemingly small infections can be life-threatening to some patients. Now, think about major infections that require heavy doses and many rounds of different antibiotics. Diseases such as sepsis and bacterial meningitis are two examples of bacterial infections that would require extreme antibiotic treatment (Poi, 2018). If those infections are caused by antibiotic-resistant organisms, it will be very hard to treat, and the chances of survival will decrease.

Lastly, a thing to be considered is immunosuppressed patients. They are already not able to fight bacterial infections as healthy individuals are able to (DeNegre, 2020). This can cause a huge threat to these individuals if they acquire an antibiotic-resistant organism. These bacterial infections mean more costly drugs that require prolonged hospital stays, or even death.

Antibiotic resistance is a significant problem that we will encounter and are forced to deal with in the nursing profession. We will have to deal with all of the side effects of antibiotic resistance. We need to be conscious of this issue now and look for ways to reduce antibiotic resistance.

Statement of Purpose

This study will address the issue of the increasing prevalence of antibiotic resistance in the healthcare world today. The focus of this study is to educate preconception women, expecting mothers, and males that are involved in the pregnancy on the benefits of breastfeeding and determining if the education was effective.

Literature Review

Most everyone knows that breastmilk is better than formula. They know that breast milk has unique properties that scientists cannot man-make. They know that breastfeeding is beneficial for both the mother and the baby. Most even know that breastfeeding is the conventional method of newborn feeding. Only probably a handful knows of the antimicrobial properties of breast milk and that it has the potential to aid in one of the biggest healthcare crises: antimicrobial resistance.

Healthcare professionals need to target a major group of people: preconception women, pregnant women, and males who will be involved in the pregnancy and breastfeeding process. Education needs to be highly informative and needs to be initiated as early as possible. The more patient education there is about the benefits of breastfeeding, the better the outcomes should be when dealing with choosing to breastfeed and choosing to breastfeed all the way until the baby needs to be weaned. A lot of research and articles have been published concerning patient education on breastfeeding, the benefits of breastfeeding, and how breastmilk can lower antimicrobial resistance.

In her article about the importance of breastfeeding education on improving the duration of breastfeeding, Willumsen (2013) states that infants need to be exclusively

breastfed for the first six months of their lives and infants should continue to breastfeed until they are two years old. The time frame of when a mother needs to initiate, wean and stop breastfeeding needs to be taught to pregnant moms to ensure they know how long their baby needs to be breastfed.

There are so many other factors that play a role in why moms decide not to breastfeed their baby or quit breastfeeding before the recommended amount of time. Research done on the factors associated with quitting breastfeeding found that when moms stop breastfeeding, they usually quit within the first six weeks (Brown, Dodds, Legge, Rayanton & Semenic 2014). In another article, Dr. Battersby sums up the reasons into three categories: physical problems, social factors and practical difficulties (2016). Education is key when dealing with these factors and trying to help the moms to overcome breastfeeding difficulties and/or lack of knowledge. Also, healthcare workers need to be especially aware of the critical six-week timeframe to encourage moms to keep breastfeeding.

It would be beneficial to educate key individuals about the benefits of breastmilk. This can increase breastfeeding compliance. In Liz Liang's article (2005), she mentions many ways that breastmilk can benefit an infant. Some of the benefits include treating burns and cold sores, healing cuts, diaper rashes, ear infections, insect bites, rashes, and sore throats. Breastmilk can and should be viewed as a natural medication with none of the side effects typical of prescription medication.

When it comes to the side effects of medications, some medications that raise strong side effects on infants are antibiotics. There was a study conducted by scientists on the adverse outcomes of using antibiotics on preterm infants. The study concluded that

each day that antibiotics were given to preterm infants, the greater the chance of them developing sepsis, necrotizing enterocolitis, or death (Cantey, Pyle, Phillip, Linda,& Sanchez, 2018). Parents need to be given information related to how antibiotics affect their kids and why antibiotics should not be given for viruses. They also need to know that when antibiotics are prescribed for minimal bacterial infections, like infections that can be cured with breast milk, there is a high risk of developing resistant bacteria that may not work the next time that antibiotic is prescribed (Abx Overuse, 2015). Medical professionals as well need to be very diligent about prescribing antibiotics for only acute bacterial infections. The U.S. Centers for Disease Control and Prevention report that "as many as one-third of those [antibiotic] medications are unnecessary" (Chordas, 2018, p. 53). They need to use proper diagnostic tests to find out if an antibiotic should be prescribed (Kesiah & Priya, 2018).

What needs to be discussed among health care system employees is the cost that antibiotic resistance creates. During a study on societal costs from antibiotic resistance, the researchers found that, due to hospitalizations alone from antibiotic-resistant drugs, the cost amounted to 41 billion dollars (Michaelidis, Fine, Lin, Linder, Nowalk, Shields, Zimmerman & Smith, 2016). That is just one aspect of the costs that antibiotic resistance creates within the healthcare system. Other costs include increased healthcare visits, research to develop new antibiotics, and multiple antibiotic drug therapy. It becomes a vicious cycle of developing new antibiotics and then having to develop even more when those become resistant.

Researchers are looking towards finding complementary and alternative medications and therapies to lower the use of antibiotics, which in turn will help solve the

antibiotic crisis (Kok, Jong, Gravendeel, Leeuwen, & Baars, 2015). Money is being partitioned to research any alternatives that can be found to help the antibiotic crisis that is rising. Breastmilk, though not "alternative or complementary" per se, is one such method of helping to resolve antibiotic resistance. Breastmilk can be used in its conventional way as an antibiotic, and it can also be used topically as an unconventional way to kill bacteria which, in turn, will decrease antibiotic resistance.

Researchers have found that the sugars in breast milk have antibacterial properties when it was tested on Group B strep bacteria (Mroz, 2017). Also, it has been found that breast milk has antimicrobial peptides in it (Sharma, V., Sharma, Chauhan & Sandeep, 2018). The research that is being done on the antimicrobial properties of the sugars in breast milk and peptides reveal strong evidence of antibiotic activity. One of the most amazing studies reveals that breast milk has a "protein-lipid complex" known as HAMLET that "could be used to lower the doses of antibiotics needed" all in order to kill bacteria "which could slow the buildup of resistance" (Cossins, 2013, p. 1). Not only that, but HAMLET "inhibits the evolution of methicillin resistance" (Cossins, 2013, p. 2). They found that HAMLET "made MRSA sensitive to the antibiotic methicillin again" (Hakansson, 2017, p. 3). Breast milk has the potential to be a breakthrough intervention in the antibiotic resistance crisis.

The practical part of breastfeeding is what needs to be discussed with the women and their significant others. They need to be informed of the conventional way of breastfeeding and the unconventional, or topical, uses of breastmilk. Both of these methods help fight antimicrobial resistance. Exclusive breastfeeding and eventual weaning is the conventional method of using breastmilk. As we have seen, the sugars,

peptides and protein-lipid complexes all serve to fight against bacterial infections. Some mothers may not know of the topical use of breastmilk as an antibiotic.

Women need to be educated on how breastmilk can be used topically as an antibiotic. In an article titled “6 Surprising Natural Uses For Breastmilk”, two of the natural uses that are listed have to do with the antibiotic properties of breastmilk (2013). One listing is the use of breastmilk in the ear canal to treat bacterial ear infections and the second use listed is the application of breastmilk on the eye to treat bacterial conjunctivitis (Borreli, 2013). One other topical use of breastmilk by means of its antibacterial properties is on the umbilical cord right after a baby is born until the umbilical cord separates completely from the newborn (Patel & Tiwari, 2018). Patel and Tiwari found that the application of breastmilk two times a day, up to 2 days after cord separation, reduced bacterial colonization and reduced the cord separation time (2018).

The problem that the health care world is experiencing is the issue of antibacterial resistance. There is a lack of education on antibiotic resistance and what people can do to help solve this crisis. This project will target expecting mothers as early in the pregnancy as possible, preconception women and men involved with the process. Education will be provided on oral and topical uses of breastmilk and how each of these can benefit their newborns. After education is provided, the goal is for the individuals to learn new information on breastfeeding and hopefully decide to breastfeed or encourage others to breastfeed.

Methodology and Implementation

There is a need to educate everyone on antibiotic resistance and ways to prevent this crisis from developing further. To help combat this emerging crisis, a project was implemented using the principal means of education. A simple PowerPoint presentation was used that included a lot of educational information. Education was provided on antibiotics, antibiotic resistance, practices that lead to antibiotic resistance, effects of antibiotic resistance, and how antibiotics are bad for babies. Further education was delivered on breastfeeding, antibiotic effects of breastfeeding, topical antibiotic use. The end of the presentation included a proposal to choose to breastfeed.

The PowerPoint presentation was presented to a convenient audience at Georgia Southern University. This audience consisted of mostly preconception females. No data was gathered on this, but usually there are individuals present that already have kids, or who are pregnant currently. The goal was to target all individuals that would be in some way involved in the breastfeeding decision-making process. This primarily includes females that are going to have to choose to breastfeed or males that will have a role in the decision to breastfeed. It can also include family members that could be involved in the decision or healthcare workers that may have patients that have the potential to educate on breastfeeding.

The project was evaluated through a simple post-presentation evaluation survey (see appendix). There were five questions. Questions were asked to ascertain if the presentation was easy to understand, if the format was effective, if they learned at least one new piece of information, how they would rate the experience and then if they had any further suggestions. These were all anonymous.

Evaluation

Surveys were collected anonymously. They were folded in half and passed to the end of the row. The data was counted and collected on a google doc and a google sheets document. This data was then evaluated to determine the meaning.

There were 86 responses, with 96 potential responses. The survey was optional and if the students did not consent to the informed consent, they did not fill it out.

The first question asked, “Was the presentation easy to understand?”. The second question asked, “Was the presentation format used to relay the information effective?”. The third question asked, “Did you learn at least one new piece of information via the presentation?”. All three of these questions had a unanimous “yes”. The fourth question asked, “Overall, how would you rate this experience?”. All selected the highest rating, of “excellent”. The last question asked, “Would you offer any suggestions?”. To this, there were a variety of answers.

One commenter stated that the presentation was a good “proposal”, but wanted more data. Another comment was that the presentation was almost too short. They would have liked for it to have been more “in-depth”. Three suggested an addition of statistics and more interaction. One also commented that there was too much of the presenter looking at the slides.

Overall, the data collected was expected and there are many new ideas that can help in the furthering of this research.

Conclusion

The data collected was overwhelmingly positive. One hundred percent of the individuals surveyed stated they learned something new, and that the education material was relayed in a way that was beneficial. That is a very positive indicator that the education provided was effective and could be a means of combating the crisis of antibiotic resistance. The data seems to suggest that education could be a viable option to increase breastfeeding, and in turn, decrease antibiotic resistance.

One thing to consider is that the questions in the survey focused solely on the education and presentation piece. It did not ask if they were more likely to breastfeed. Questions of this sort would directly relate to the likeliness of breastfeeding. Another consideration is the population surveyed. Did the students answer positively to all questions asked because they were in a classroom setting? To further this research, it would be beneficial to educate a different population, such as pregnant women, soon-to-be-fathers, and women's health workers.

Overall, this project was successful based on the goals established at the beginning. Through the research of literature, it was confirmed that antibiotic resistance is a major healthcare crisis. It was also confirmed that breastmilk can, indeed, fight antibiotic resistance. The implementation part of the project included a PowerPoint presentation to provide education on this subject. A survey was conducted based on the education provided and the data resulted in a very positive response, suggesting that education can provide a means of combating antibiotic resistance.

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Appendix

Post Presentation Evaluation

1. Was the presentation information provided easy to understand?
    a. Yes
    b. No

2. Was the presentation format used to relay the information effective?
    a. Yes
    b. No

3. Did you learn at least one new piece of information via the presentation?
    a. Yes
    b. No

4. Overall, how would you rate this experience?
    a. Excellent
    b. Good
    c. Okay
    d. Poor

5. Would you offer any suggestions?